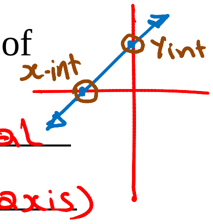
Name: ____________________ *Math 10F&PC H.* Date: ______________

Chapter Ch.5 Relations and Functions

5.7 Interpreting Graphs of Linear Functions

Focus: Use intercepts, rate of change, domain, and range to describe the graph of a linear function.

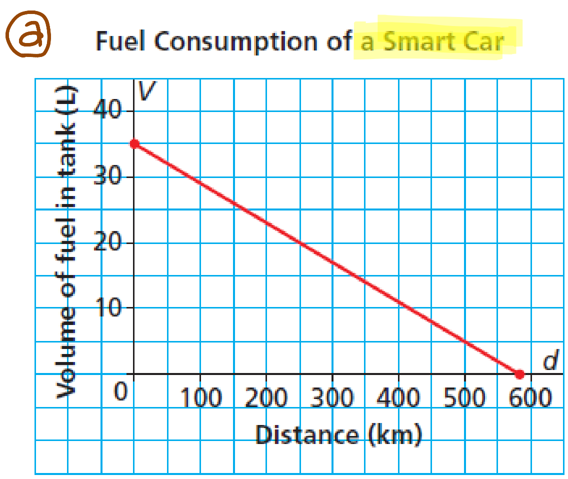


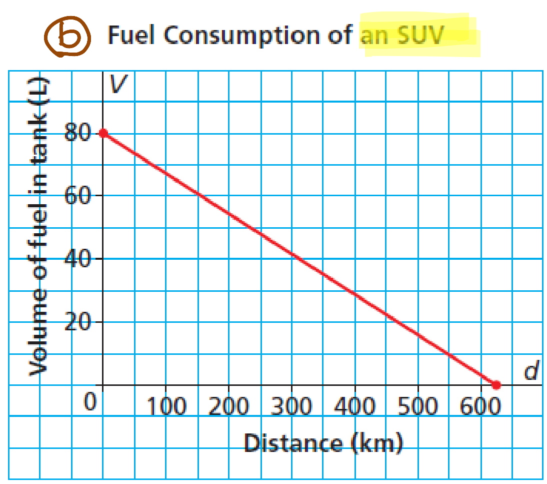
Linear Function: Any graph of a straight line that is not vertical

Horizontal Intercept: Point of the graph that intersect with (x-axis)

Vertical Intercept: Point of the graph that intersect with (Y-axis)

Example 1: A Smart car and an SUV have full fuel tanks, and both cars are driven on city roads until their tanks are nearly empty. The graphs show the fuel consumption for each vehicle.





a) Determine the horizontal and vertical intercepts. Describe what they mean.

x int. (a) Horiz. int (x int.) = 580 Km (b) Horiz. int. (x int) = 625 Km

Y int. (a) vertical int. (Y int) = 35 L (b) vertical int. ( ) = 80 L

b) What are the domain and range for each function?

(a) D: $\{x \mid 0 \leq x \leq 580,\ x \in R\}$

R: $\{Y \mid 0 \leq Y \leq 35,\ Y \in R\}$

The horizontal intercept is known as the x - intercept, *find it by making* Y = 0.

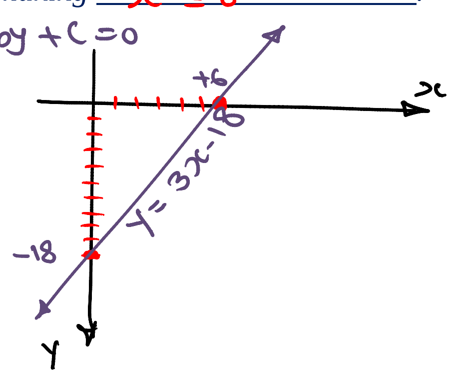
The vertical intercept is known as the Y-intercept, *find it by making* x = 0.

Ex:- Find x-int & Yint.

$Y = f(x) = 3x - 18$

$\{Y = mx + b\}$

ax+by+C=0



x-int when Y=0

$0 = 3x - 18$

$3x = 18$ $\boxed{x = 6}$

$(6, 0)$

Yint. when x=0

$Y = 3(0) - 18$

$Y = -18$

$(0, -18)$

Example 2: Sketch the graph using intercepts.

$$y = -2x + 5$$

$y = mx + b$

$b = 5$

$m = -2$

using x int. & y int

x int. when $y = 0$

$0 = -2x + 5$

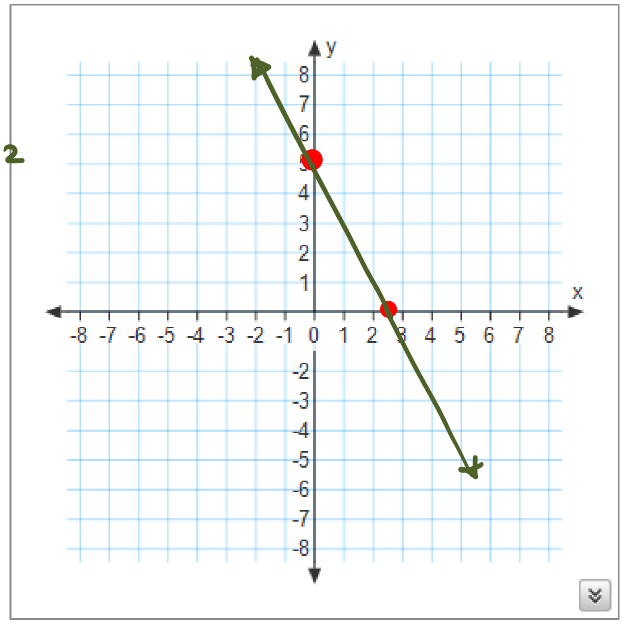
$2x = 5$ $\quad x = \frac{5}{2}$

$(\frac{5}{2}, 0)$

y int. when $x = 0$

$y = -2(0) + 5$ $\quad y = 5$

$(0, 5)$



Example 3: The graphs below show the temperature, T degrees Celsius, as a function of time, t hours, at different locations.

a) Which graph has a rate of change (slope of the line) of 5°C/h and a vertical intercept of -10°C?

Graph ii)

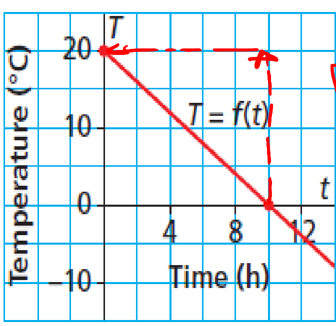
b) Which graph has a rate of change of -10°C/h and a vertical intercept of 20°C?

Graph iii)

c) Calculate the rate of change and the vertical intercept for graph (i) & (iv)

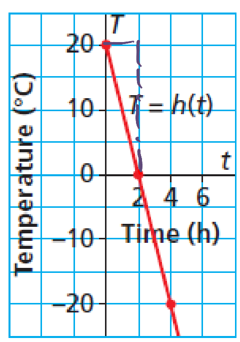
rate of change $= \frac{\text{rise}}{\text{run}}$ $\qquad$ i) $m = \frac{20}{-10} = -2\ °C/h$

i)



$\boxed{m = -2\ °C/h}$

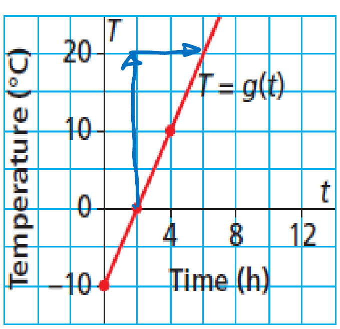
iii)



iii) $m = \frac{20}{-2}$

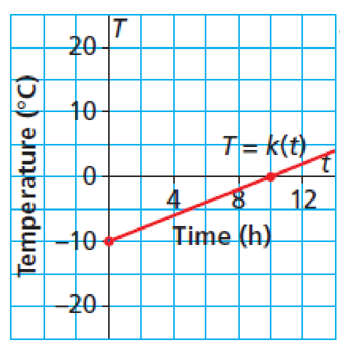
$\boxed{m = -10\ °C/h}$

ii)



$m = \frac{20}{4} = 5\ °C/h$

iv)



$\boxed{m = \frac{10}{10} = 1\ °C/h}$

Sketch a graph of each linear function:

a) $f(x) = 4x - 3$

Determine Point where graph intersects x-axis

$y = f(x)$

X-Intercept when $y = 0$

This point means: horizontal intersect

$0 = 4x - 3$ $\quad$ $4x = 3$

$\left(\frac{3}{4}, 0\right)$ $\quad$ $\boxed{x = \frac{3}{4}}$

Point where graph intersects y-axis Y int.

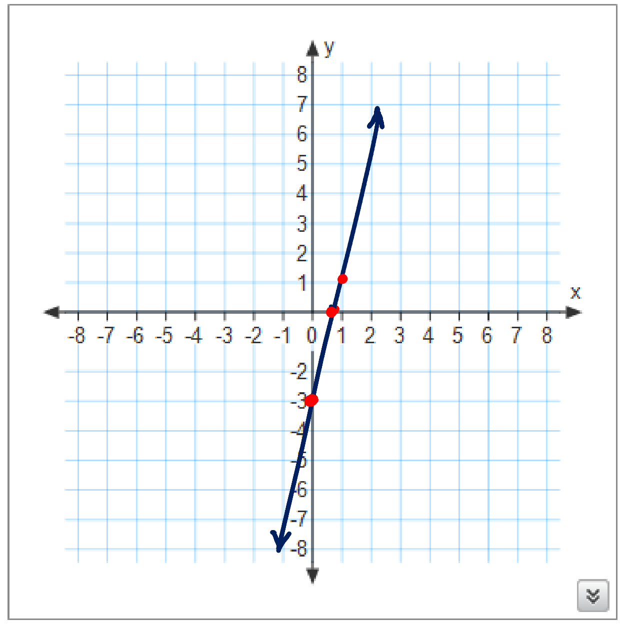
Y-Intercept when $x = 0$

This point means:

$y = 4(0) - 3$

$\boxed{y = -3}$

$(0, -3)$



b) $f(x) = -2x + 7$

Determine Point where graph intersects x-axis

X-Intercept when $y = 0$

This point means: Horizontal intersect

Point where graph intersects y-axis ________

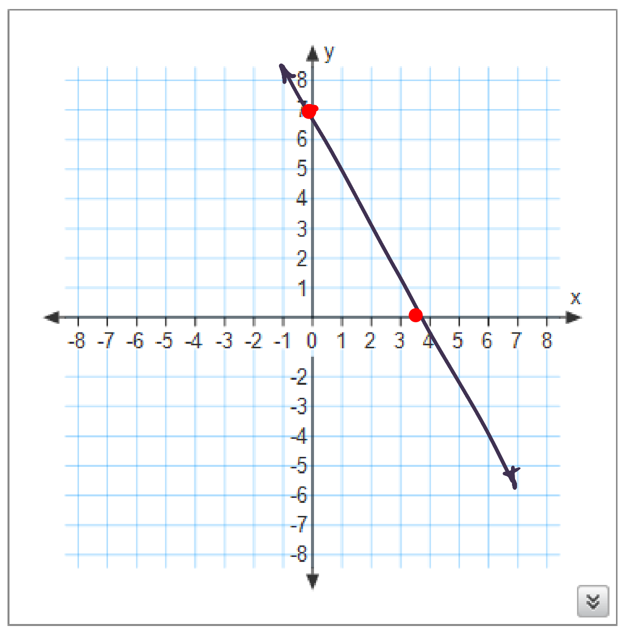
Y-Intercept when $x = 0$

This point means

x int $\quad$ $0 = -2x + 7$

$2x = 7$ $\quad$ $\boxed{x = \frac{7}{2}}$

Y int. $\quad$ $y = -2(0) + 7$ $\quad$ $\boxed{y = 7}$



Example 4:

. If $f(x) = 6x^2 - 2x + 1$, find $f(3x - 1)$

$$f(3x-1) = 6(3x-1)^2 - 2(3x-1) + 1$$
$$= 6(9x^2 - 6x + 1) - (6x - 2) + 1$$
$$= 54x^2 - 36x + 6 - 6x + 2 + 1$$
$$= 54x^2 - 42x + 9$$

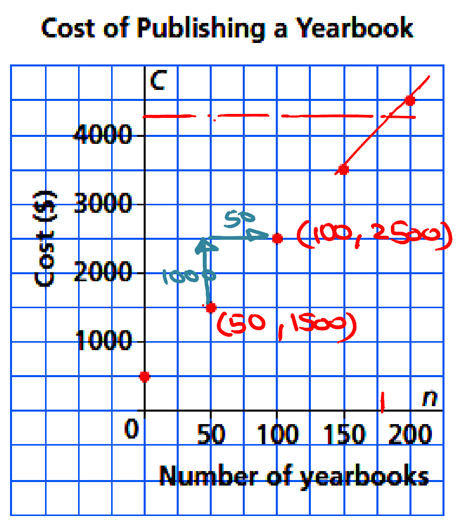
Key Idea:

We can use x & y intercepts to graph a linear function written in function notation.

- ***To determine the y-intercept, evaluate f(x) when x = 0. (In other words, find f(0).***
- ***To determine the x-intercept, determine the value of x when f(x) = 0.***

Example 5: This graph shows the cost of publishing a school yearbook for Collège Louis-Riel in Winnipeg.

The budget for publishing costs is $4200. What is the maximum number of books that can be printed?



Method I) use the graph to estimate

the result would not be acurate

approximatly ≃ 182 yearbooks

Method II) use Equation

$y \Rightarrow C(n) = \text{rate}\,(n) + 500$

$C(n) = 20n + 500$

$4200 = 20n + 500$

$-500 \qquad\qquad -500$

$3700 = 20n$

$\boxed{n = 185 \text{ yearbooks}}$

rate = change = $\frac{\text{rise}}{\text{run}}$

rate = $\frac{\Delta y}{\Delta x}$

rate = $\frac{2500 - 1500}{100 - 50}$

$= \frac{1000}{50} = 20$

Example 5:

If $f(x) = 3x + 2$, find the value of x when $f(x) = 17$

$17 = 3x + 2$

$-2 \qquad\quad -2$

$15 = 3x$

$\boxed{x = 5}$

find $f(x)$ when $x = -7$

$f(x) = 3(-7) + 2$

$= -21 + 2$

$f(-7) = -19$

Assignment: p. 319 Q #6–8, 10,13,16,17

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5.7 Interpreting Graphs of Linear Functions

1. Determine if the following tables represent a direct variation relationship.

1.

X	Y
1	10
4	9
7	8

2.

X	Y
90	3
80	2
70	1

3.

X	Y
9	3
11	5
13	7

4.

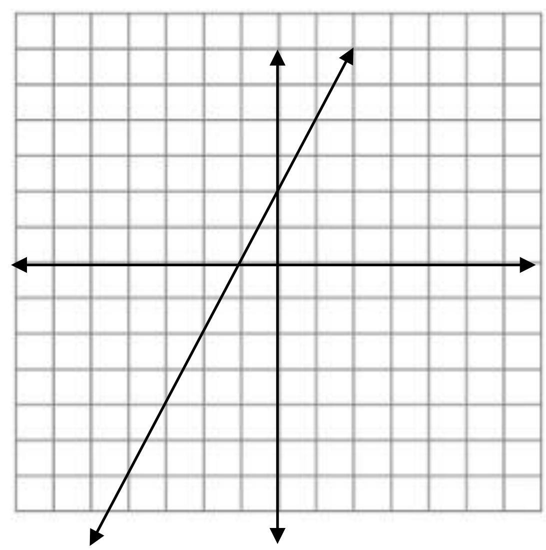
X	Y
75	15
85	10
90	5

2. Given the following 3 functions, write an equation for each. Which of the functions has the greatest rate of change?

A)

x	2	4	7	8
y	5	11	20	23

B)



C) The output of a function is equal to 2 less than four times the output.

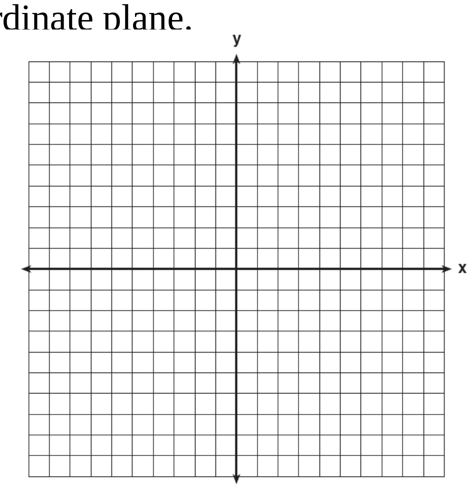
3. Write the following in slope-intercept form:

a. $6x + 2y = -10$

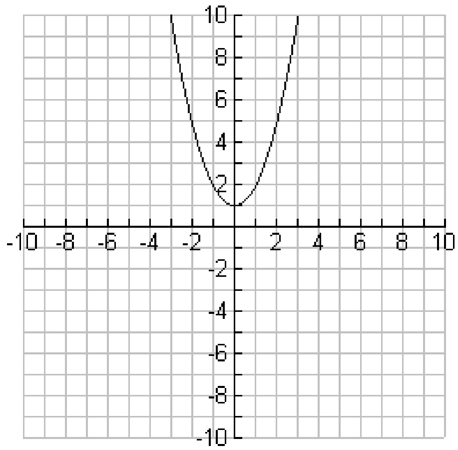
b. $-x + 2y = 10$

c. If the equation for the above graph is $f(x) = x^2 + 1$, calculate $f(x-2)$

4. Graph the linear equation 6y + 4x = 18 on the coordinate plane.



5. Find the value of *y* at the given value of *x* in the following graph.



$f(2) =$

$f(-3) =$

$f(0) =$

$f(x) = 5$

6. If $f(x) = 2x^2 + x - 5$, calculate:

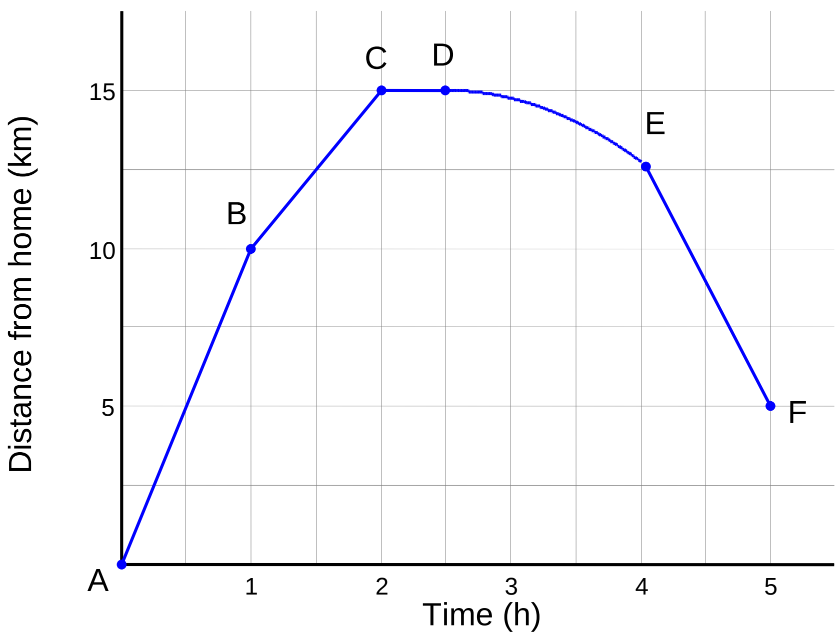
a) $f(-3)$

b) $f\left(\sqrt{5}\right)$

c) $f(2a)$

d) $f(3y-1)$

7. Devin went for a bicycle ride. The graph below shows his trip. **Note:** Distance is the number of kilometres from home.



a) Calculate his speed during the first hour (AB) and the second hour (BC). Show your work.

b) How does the speed between A and B compare with the speed between B and C?

c) Explain what segment CD tells you about Devin's motion.

d) Which section of the graph shows that Devin was changing speeds? Explain.

e) What information can you determine from segment EF?